Case Report

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# Evidence of Rapid Fusion in a Two Level ACDF Patient Using OssDsign Catalyst® Bone Graft Substitute

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**ABSTRACT**

Anterior cervical discectomy and fusion (ACDF) remains the surgery of choice for treating cervical spondylosis and degenerative disc disease, but success rates may decrease as more levels are involved. A new silicate enriched calcium phosphate bone graft substitute with nanoscale architecture was used in a two-level ACDF and showed earlier than expected healing with corresponding excellent clinical improvement.

**Keywords:** ADCF; Anterior Cervical Discectomy and Fusion; Cervical Fusion; Catalyst; Synthetic Bone Graft; Silicate; Calcium Phosphate; Lnterbody Fusion

**Abbreviations:** ADCF: Anterior Cervical Discectomy and Fusion; BMI: Body Mass Index; CT: Computed Tomography Scan; TLIF: Transforaminal Lumbar Interbody Fusion; VAS: Visual Analogue Score for Pain; ODI: Oswestry Disability Index; ACP: Anterior Cervical Plate

## Introduction

Anterior cervical discectomy and fusion (ACDF) remains the surgery of choice for treating cervical spondylosis and degenerative disc disease which often results in cervical myelopathy and radiculopathy [1]. The procedure, which involves decompression and fusion, has been associated with very positive clinical outcomes [2]. Fusion of multiple segments in ACDF may however, result in higher rates of pseudoarthrosis, lower fusion rates, increased graft subsidence, and a higher chance of subsequent surgery compared to single level fusions [3-5]. Since the early 2000s, spine fusion surgery has witnessed a surge in the use of synthetic bone grafts. This shift has been driven by advancements in technology that have produced innovative and superior graft materials [6]. Newer synthetic bone graft substitutes have made considerable progress with microporosity, particle size, and/or surface technology, with some reaching nanoscale dimensions. Progress has also been achieved with the enhanced chemistry of these bone graft substitutes, particularly ionic substitutions, which serve to instruct key proteins at the graft site to initiate or stimulate rapid bone formation and remodeling [7]. A new silicate enriched (5.8 wt%) calcium phosphate bone graft substitute (Catalyst®, OssDsign, Columbia, MD) with nanoscale architecture is gaining popularity among spine surgeons in the US. The following is a case report where rapid bone formation occurred earlier than expected with corresponding clinical improvement in a two level ACDF.

## Case Description

The patient was a 50-year-old obese male (BMI 38) who presented with ongoing 10+ years of axial neck pain and bilateral upper extremity symptoms which include lateral shoulder radiation down the extensor surface of the arm, as well as the flexor surface of the forearm to the first three digits. There was some grip strength weakness but no gait ataxia or bowel/bladder disfunction. Radiographic and clinical findings showed severe C5-C7 cervical spondylosis with associated radiculopathy. The patient failed conservative measures including physical therapy and injections by pain management, and therefore

was scheduled for surgery. All available treatment options, alternatives, including no surgery, and risks of surgery were discussed with the patient in detail. The patient underwent C5-C7 anterior cervical discectomy and fusion, which involved decompression of spinal cord and neural elements, placement of intervertebral titanium spacers (Nuvasive Modulus) at C5-C6 and C6-C7, and anterior instrumentation and screw fixation from C5 C7 (Nuvasive ACP).

The bone graft chosen for this procedure was OssDsign Catalyst Bone Graft, where 2.5ccs were placed inside each cage. The patient tolerated the procedure well and was discharged without complications. At three weeks the patient returned for his wound check follow-up and reported that the numbness and tingling in the bilateral upper extremes began to slowly improve. At six weeks, the patient reported progressive improvement in his numbness and paresthesia with only minor arm pain sporadic in nature. X-rays showed intact and well-placed hardware and his incision appeared well healed. The patient returned for his 3-month follow-up (102 days after surgery) and reported complete resolution of his preoperative radiculopathy and paresthesia, with only occasional posterior muscular stiffness responsive to physical therapy. Both X-rays and CT scan showed intact hardware and early arthrodesis taking place across the C5-C6 and C6-C7 levels (Figures 1-3).

**Figure 1:** 3-month Radiograph shows fusion at both levels.

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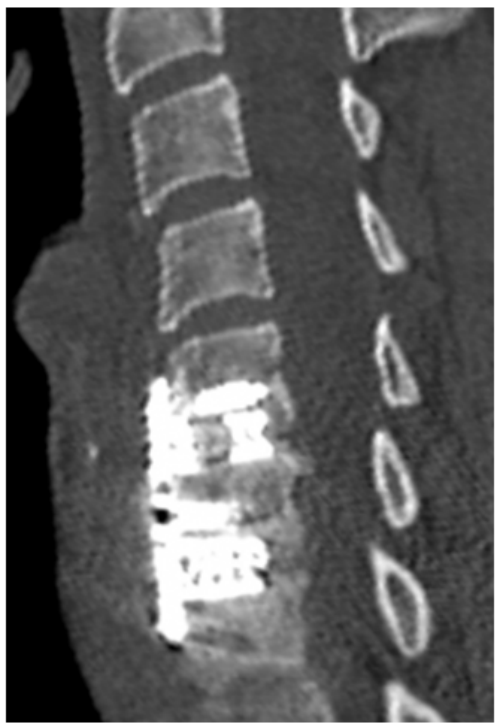

**Figure 2:** 3-month CT Scan shows bony bridge posterior to cage between C5-C6

**Figure 3:** 3-month CT Scan shows bony bridge posterior to cage between C6-C7.

## Discussion

There are numerous clinical reports which describe the decrease in cervical fusion success as the number of levels involved increase. Examples include Swank et al. who reported that the likelihood of pseudoarthrosis increased from 10% in 1-level surgery to 44% and 45% in 2-level and 3-level surgeries respectively [3]. Brodke and Zdeblick reported a fusion rate in 1-level ACDF as high as 97%, while the fusion rate in 3-level ACDF decreased to 83%. Zigler et al. reported fusion rates at 2 years were 89.3% in 1-level ACDF vs. 79.8% in 2-level ACDF [4,5]. Catalyst bone graft has been shown to provide consistent and rapid bone healing in one level TLIF procedures with 29% fused at 3 months, 64% fused at 6 months, and 93% at 12 months. The fusion success was highly correlated with clinical outcomes shown by significantly improved VAS and ODI scores. [8] The case reported here offers optimism to surgeons that similar results may be achieved in multi-level ACDF procedures with this next generation bone graft.

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